

**Claims**

1. An illuminator, preferably for microscopic and/or fluorescence-based applications, comprising:
  - 5 - a light source (12);
  - optical components (16-1, 18-1, 20-1, 16-2, 18-2, 20-2), which define a plurality of light paths (14-1, 14-2; 14-1, 14-2, 14-3) originating from the light source;
  - 10 - a light conditioning arrangement (22-1 or 22-2 or 22-3 respectively) in at least one of the light paths,
  - at least one light output (34; 34-1, 34-2), to which an associated device to be supplied with light or conditioned light, for example a microscope (40; 60) or a fluorescence measuring device (60), is connected or may be connected;
  - 15 - at least one light path selector unit (24; 24, 25), which comprises a plurality of input light path portions assigned in each case to a different one of the light paths and at least one output light path portion leading to the light output or to an assigned one of the light outputs;
  - 20 wherein, by means of the light path selector unit adjustable between a plurality of selector states, when the light path selector unit is in an appropriate selector state, each of the light paths may selectively be connected as selected light path via the output light path portion to the light output or via a predetermined or selected output light path portion to a predetermined or selected light output.
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2. An illuminator according to claim 1, characterised in  
that the light path selector unit (24; 24, 25) may be  
adjusted into at least one selector state in which no  
5 light path is selected, such that none of the light  
paths is connected to the or a light output.
3. An illuminator according to claim 1 or 2,  
characterised in that the light path selector unit  
10 (24) comprises at least one optical light deflector  
element (26) adjustable between a plurality of  
selection positions, wherein each selector state may  
be achieved on the basis of at least one selection  
position of the light deflector element, light which  
15 is incident via the assigned selected light path being  
diverted in the respective selector state into the  
output light path portion or into the predetermined or  
selected output light path portion and light which is  
incident via the or a respective non-selected light  
20 path not being diverted into the or into any output  
light path portion.
4. An illuminator according to claim 3, characterised in  
that the light path selector unit (24) comprises at  
25 least one mirror (26) arranged to be swivellable or  
rotatable by means of an actuator (28).
5. An illuminator according to claim 4, characterised in  
that the actuator takes the form of a galvanometer  
30 (28).
6. An illuminator according to any one of claims 3 to 5,  
characterised in that the light path selector unit

comprises at least one micromechanical adjusting mirror arrangement with a plurality of micromechanical adjusting mirrors, which may be controlled electrically in order to adjust the adjusting mirrors or selected ones of the adjusting mirrors between a plurality of selection positions.

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7. An illuminator according to claim 6, characterised in that the adjusting mirrors take the form of swivel mirrors.

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8. An illuminator according to any one of claims 1 to 7, characterised in that the light conditioning arrangement (22-1, 22-2; 22-1, 22-2, 22-3) comprises an optical wavelength selection arrangement, by means of which at least one predetermined or settable selection wavelength, preferably precisely one predetermined or settable selection wavelength, may be selected with a predetermined or settable selection bandwidth for propagation in the direction of the light path selector unit (24 or 25).

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9. An illuminator according to claim 8, characterised in that in each of the light paths (14-1, 14-2; 14-1, 14-2, 14-3) there is provided a light conditioning arrangement (22-1, 22-2; 22-1, 22-2, 22-3) comprising a respective wavelength selection arrangement, by means of which light conditioning arrangement selection wavelengths differing with regard to light path may be selected for propagation in the direction of the light path selector unit.

10. An illuminator according to any one of claims 1 to 9,  
characterised in that the light conditioning  
arrangement comprises an optical polariser  
arrangement.

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11. An illuminator according to any one of claims 1 to 10,  
characterised in that the light conditioning  
arrangement comprises an adjustable optical intensity  
attenuating arrangement or beam shading arrangement  
10 (50) for setting an output intensity at the light  
output.

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12. An illuminator according to any one of claims 1 to 11,  
characterised by at least one light trap (36) assigned  
15 to the light path selector unit, to which light trap a  
non-selected light path may be connected via the light  
path selector unit and/or by an optical shutter  
arrangement in at least one of the light paths or  
light path portions.

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13. An illuminator according to any one of claims 1 to 12,  
characterised in that precisely one light output (34)  
is provided, to which precisely one selected one of  
the light paths may preferably be connected by means  
25 of the light path selector unit.

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14. An illuminator according to any one of claims 1 to 12,  
characterised in that at least two light outputs (34-  
1, 34-2) are provided, and in that at least two  
30 selected light paths may be simultaneously connected  
to a respective one of the light outputs by means of  
the light path selector unit or by means of at least  
two separate light path selector units (24, 25).

15. An illuminator according to any one of claims 1 to 14, characterised in that at least two light path selector units (24, 25) may be adjusted into mutually assigned selector states, in such a way that a selected one of the light paths is connected via these light path selector units to the light output or a predetermined or selected light output.

10 16. An illuminator according to any one of claims 1 to 15, characterised in that more than two light paths (14-1, 14-2, 14-2) are provided.

15 17. An illuminator according to any one of claims 1 to 16, characterised in that reflective components (18-1, 20-1, 18-2, 20-2) and/or refractive components (16-1, 16-2) and/or diffractive components are provided as the optical components defining light paths.

20 18. An illuminator according to any one of claims 1 to 17, characterised in that mirrors (18-1, 20-1, 18-2, 20-2) and/or lenses (16-1, 16-2) and/or diaphragms are provided as the optical components defining light paths.

25 19. An illuminator according to any one of claims 1 to 18, characterised in that the light paths take the form, at least between the light source and the light path selector unit, of free radiation light paths (14-1, 14-2; 14-1, 14-2, 14-3) which are not bound to a medium which defines the light path.

20. An illuminator according to any one of claims 1 to 19, characterised in that the light output or the light outputs are formed on the basis of a (respective) light guide (34; 34-1, 34-2).

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21. An illuminator according to any one of the preceding claims, characterised by a control unit controlling the at least one light path selector unit and optionally the light conditioning arrangement or light conditioning arrangements, wherein the control unit is designed to adjust the light path selector unit in defined manner between its selector states.

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22. An illuminator according to claim 21, characterised in that the control unit is designed to provide defined adjustment times for adjusting the light path selector unit between its selector states.

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23. An illuminator according to claim 21 or 22, characterised in that the control unit is designed to adjust the light path selector unit in accordance with at least one predetermined or predeterminable selection program between its selector states.

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24. An optical object investigation device, comprising an object area (64), in which an object (72) to be investigated may be placed, an observation beam path (62), which leads from the object area to an image area (66), and at least one illumination beam path (80, 82, 100) connected to a light input (84, 86, 102), by means of which illumination beam path the object area may be illuminated, characterised in that the object investigation device comprises an

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illuminator (10) according to any one of the preceding claims, which illuminator is connected or may be connected to the light input with a light output (34 or 34-1 or 34-2).

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25. An object investigation device according to claim 24, characterised in that it comprises at least one incident-light illumination beam path, preferably at least two incident-light illumination beam paths (80, 82), which optionally coincide(s) at least in part with the observation beam path (62).

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26. An object investigation device according to claim 24 or 25, characterised in that it comprises at least one transmitted-light illumination beam path (100).

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27. An object investigation device according to any one of claims 24 to 26, characterised in that it comprises at least two, preferably at least three illumination beam paths (80, 82, 100), which may be supplied alternately or - preferably - simultaneously with illumination light from the illuminator (10).

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28. An object investigation device according to any one of claims 24 to 27, characterised in that it comprises a microscope (40; 60) comprising the object area (64), the observation beam path (62) and the at least one illumination beam path (80, 82, 100).

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30 29. An object investigation device according to any one of claims 24 to 28, characterised in that it comprises a fluorescence measuring device (60) comprising the object area (64), the observation beam path (62) and

the at least one illumination beam path (80, 82, 100) and optionally including the microscope.